

## SECTION 02711

## FOUNDATION DRAINAGE SYSTEM

## 1 GENERAL

## 1.1 SUMMARY (NOT APPLICABLE)

## 1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

## AMERICAN ASSN OF STATE HIGHWAYAND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 252	(1985) Corrugated Polyethylene Drainage Tubing
AASHTO M 278	(1987I) Class PS50 Polyvinyl Chloride (PVC) Pipe
AASHTO M 294	(1986) Corrugated Polyethylene Pipe, 12 to 24-inch Diameter

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 33	(1986) Concrete Aggregates
ASTM D 2751	(1988a) Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings
ASTM D 3034	(1988b) Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D 3212	(1986) Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM F 405	(1985) Corrugated Polyethylene (PE) Tubing and Fittings
ASTM F 667	(1985) Large Diameter Corrugated Polyethylene Tubing and Fittings
ASTM F 758	(1982) Smooth-Wall Poly(Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage

ASTM F 949

(1986a) Poly(Vinyl Chloride) (PVC) Corrugated  
Sewer Pipe With a Smooth Interior and  
Fittings

### 1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01300 SUBMITTALS:

#### SD-13 Certificates

Materials; FIO.

Certifications from the manufacturers attesting that materials meet specification requirements.

#### SD-14 Samples

Materials; GA

Two randomly selected samples of each type of pipe and fitting, prior to delivery of materials to the site.

### 1.4 DELIVERY, STORAGE AND HANDLING

Materials placed in storage shall be stored with protection from the weather, humidity and temperature variations, dirt and dust, or other contaminants. Plastic pipe shall not be exposed to direct sunlight for more than 6 months from time of manufacturer to installation.

## 2 PRODUCTS

### 2.1 MATERIALS

Pipe for foundation drainage system shall be of the type and size indicated. Any of the types listed may be used; however, the same type shall be used throughout the project.

#### 2.1.1 Plastic Pipe

Plastic pipe shall contain ultraviolet inhibitor to provide protection from exposure to direct sunlight.

##### 2.1.1.1 Corrugated Polyethylene (PE) Drainage Pipe

Use ASTM F 405 heavyduty for pipe 3 to 6 inches in diameter inclusive, ASTM F 667 for pipe 8 to 24 inches in diameter; or use AASHTO M 252 for pipe 3 to 10 inches in diameter or AASHTO M 294 for pipe 12 to 24 inches in diameter. Fittings shall be pipe manufacturer's standard type and shall conform to the indicated specification.

#### 2.1.1.2 Acrylonitrile-Butadiene-Styrene (ABS) Pipe

ASTM D 2751, with a maximum SDR of 35.

#### 2.1.1.3 Polyvinyl Chloride (PVC) Pipe

ASTM F 758, Type PS 46, ASTM D 3034, ASTM F 949, or AASHTO M 278 with a minimum pipe stiffness of 46 psi.

#### 2.1.1.4 Circular Perforations in Plastic Pipe

Circular holes shall be cleanly cut, not more than 5/16 inch or less than 3/16 inch in diameter, and arranged in rows parallel to the longitudinal axis of the pipe. Perforations shall be approximately 3 inches apart, center-to-center, along rows. The rows shall be approximately 1-1/2 inches apart and arranged in a staggered pattern so that all perforations lie at the midpoint between perforations in adjacent rows. The rows shall be spaced over not more than 155 degrees of circumference. The spigot or tongue end of the pipe shall not be perforated for a length equal to the depth of the socket and perforations shall continue at uniform spacing over the entire length of the pipe. Manufacturer's standard perforated pipe which essentially meets these requirements may be used with prior approval of the Contracting Officer.

#### 2.1.1.5 Slotted Perforations in Plastic Pipe

Circumferential slots shall be cleanly cut so as not to restrict the inflow of water and uniformly spaced along the length and circumference of the tubing. Width of slots shall not exceed 1/8 inch or be less than 1/32 inch. The length of individual slots shall not exceed 1-1/4 inches on 3-inch diameter tubing; 10 percent of the tubing inside nominal circumference on 4- to 8-inch diameter tubing; and 2-1/2 inches on 10-inch diameter tubing. Rows of slots shall be symmetrically spaced so that they are fully contained in quadrants of the pipe. Slots shall be centered in the valleys of the corrugations of profile wall pipe. The water inlet area shall be a minimum of 0.5 square inch per linear foot of tubing. Manufacturer's standard perforated pipe which essentially meets these requirements may be used with prior approval of the Contracting Officer.

#### 2.1.2 Fittings

Fittings shall be of compatible materials for pipe, of corresponding weight and quality, and as specified herein.

#### 2.1.3 Cleanouts and Piping Through Walls

Cleanout pipe and fittings and piping through walls and footings shall be cast-iron soil pipe. Each cleanout shall have a brass ferrule and a cast-brass screw-jointed plug with socket or raised head for wrench.

#### 2.1.4 Sand and Gravel Filter Materials for Foundation Drains

Sand and gravel filter materials shall be [in accordance with Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS] [coarse aggregate conforming to ASTM C 33, size number [8] 4 [\_\_\_\_\_]].

#### 2.1.5 Protective Covering for Sand and Gravel Filter Materials

Protective covering shall be [building paper] [or] [fiberglass mat of lime borosilicate glass fibers. Fibers shall be 8 to 12 microns in average diameter, 2 to 4 inches in length, and bonded with phenol formaldehyde resin. Mat shall be roll type, nonperforated, water permeable, with thickness between 1/4 and 1/2 inch and density of 3/4 pcf].

### <PRT>PART 3 EXECUTION

#### 2.2 GENERAL REQUIREMENTS

##### 2.2.1 Extent

Foundation drainage shall be furnished and installed as a complete system as shown.

##### 2.2.2 Outlet Connections

Foundation pipe shall be terminated as shown.

##### 2.2.3 Drainage Lines

Drainage lines shall be constructed of perforated pipe.

##### 2.2.4 Outlet Lines

Outlet lines shall be constructed of closed-joint nonperforated, nonporous pipe.

#### 2.3 INSTALLATION

##### 2.3.1 Trenching and Excavation

Required trenching and excavation shall be in accordance with Section 02221 EXCAVATION, FILLING, AND BACKFILLING FOR BUILDINGS. Trenches shall be kept dry during installation of drainage system. Changes in direction of drain lines shall be made with 1/8 bends. Wye fittings shall be used at intersections.

##### 2.3.2 Bedding

Graded bedding, minimum 6 inches in depth, shall be placed in the bottom of trench for its full width and length and compacted as specified prior to laying of foundation drain pipe. Each section shall rest firmly upon the bedding, through the entire length, with recesses formed for bell joints. Except for recesses for bell joints, the bedding shall fully support the lower quadrant of the pipe.

### 2.3.3 Pipe Laying

Drain lines shall be laid to true grades and alignment with a continuous fall in the direction of flow. Bells of pipe sections shall face upgrade. Interior of pipe shall be cleaned thoroughly before being laid. When drain lines are left open for connection to discharge lines, the open ends shall be temporarily closed and the location marked with wooden stakes. Perforated pipe shall be laid with perforations facing down. Any length that has had its grade or joints disturbed shall be removed and relaid at no additional cost to the Government. Perforated corrugated polyethylene drainage tubing and plastic piping shall be installed in accordance with manufacturer's specifications and as specified herein. Tubing and piping with physical imperfections shall not be installed.

### 2.3.4 Jointing

#### 2.3.4.1 Perforated Pipes

Perforated drain pipes shall be laid with closed joints.

#### 2.3.4.2 ABS Pipe

ABS pipe shall be joined using solvent cement or elastomeric joints and shall be in accordance with [ASTM D 2751](#), with dimensions and tolerances in accordance with TABLE II therein.

#### 2.3.4.3 PVC Pipe

PVC pipe joints shall be in accordance with [ASTM D 3034](#), [ASTM D 3212](#), or [ASTM F 949](#).

#### 2.3.4.4 Corrugated Polyethylene

Corrugated polyethylene (PE) pipe joints shall be in accordance with [ASTM F 405](#) or [ASTM F 667](#).

### 2.3.5 Outlet Lines

The outlet end of drain lines connecting with an open gutter or outfall shall be [covered with a removable wire basket of 16-mesh copper or bronze wire cloth fastened with brass or wire straps] [finished as shown].

### 2.3.6 Backfilling

After joints and connections have been inspected and approved, the specified pervious backfill material shall be placed [a minimum width of 6 inches on each side of the pipe] [for the full width of the trench and full width between pipe and adjacent walls] and 12 inches above the top of the pipe. When placing the backfill, care shall be taken to prevent displacement of or injury to the pipe. A protective covering, as specified, shall be placed over the pervious backfill for the full width of the trench before regular backfill is placed. Backfill shall be compacted as specified in Section [02221](#) EXCAVATION, FILLING AND BACKFILLING FOR BUILDINGS.

